

NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Metallurgy and Material Science - NOC:Introduction to Materials Science and Engineering

Subject Co-ordinator - Prof. Rajesh Prasad

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction
- Lecture 2 - Crystal geometry
- Lecture 3 - Unit cell
- Lecture 4 - Classification of lattices
- Lecture 5 - Gaps in Bravais lattice list
- Lecture 6 - Symmetry - I
- Lecture 7 - Symmetry - II
- Lecture 8 - Classification of lattices on the basis of symmetry
- Lecture 9 - A symmetry based approach to Bravais lattices
- Lecture 10 - Miller indices of directions
- Lecture 11 - Miller indices for planes
- Lecture 12 - Miller indices for plane and its normal in Cubic Crystal
- Lecture 13 - Weiss Zone law and its applications
- Lecture 14 - Inter-planar spacing
- Lecture 15 - Bragg's Law
- Lecture 16 - Close-packing of hard spheres
- Lecture 17 - Hexagonal Close-Packed (HCP) structure
- Lecture 18 - Lattice and motif of HCP crystals
- Lecture 19 - c/a ratio of an ideal HCP crystal
- Lecture 20 - ABCABC stacking of close-packed spheres
- Lecture 21 - Voids in close-packed structures
- Lecture 22 - Solid solutions - I
- Lecture 23 - Solid solutions - II
- Lecture 24 - Hume-Rothery rules
- Lecture 25 - Ordered and disordered solid solutions
- Lecture 26 - Graphene
- Lecture 27 - Structure of graphite
- Lecture 28 - Structure of diamond
- Lecture 29 - Carbon nanotubes (CNT)

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- Lecture 30 - Buckminsterfullerene (C60)
- Lecture 31 - Ionic solids
- Lecture 32 - NaCl
- Lecture 33 - CsCl
- Lecture 34 - ZnS
- Lecture 35 - BCC vs CsCl
- Lecture 36 - Amorphous Solids
- Lecture 37 - Polymers
- Lecture 38 - Vinyl Polymers
- Lecture 39 - Thermoplasts and Thermosets
- Lecture 40 - Tacticity
- Lecture 41 - Copolymers
- Lecture 42 - Crystallinity in Polymers
- Lecture 43 - Defects in Crystals
- Lecture 44 - Vacancies
- Lecture 45 - Edge dislocation
- Lecture 46 - Edge dislocation
- Lecture 47 - Characteristic vectors of a dislocation
- Lecture 48 - Edge, screw and mixed dislocations
- Lecture 49 - Screw dislocations
- Lecture 50 - Burgers circuit
- Lecture 51 - Elastic energy of a dislocation line
- Lecture 52 - Burgers vector
- Lecture 53 - Burgers vector of a dislocation is constant along the line
- Lecture 54 - Geometrical properties of a dislocations
- Lecture 55 - Dislocation cannot end abruptly in a crystal
- Lecture 56 - Dislocation cannot end abruptly in a crystal
- Lecture 57 - Dislocation cannot end abruptly in a crystal
- Lecture 58 - Dislocation motion
- Lecture 59 - 2D defects
- Lecture 60 - Free surface or external surface of the crystal
- Lecture 61 - Stacking faults
- Lecture 62 - Twin boundary
- Lecture 63 - Grain boundary
- Lecture 64 - Small angle symmetric tilt boundary
- Lecture 65 - Ball bearing model
- Lecture 66 - Phase diagrams
- Lecture 67 - Phases and components
- Lecture 68 - Uses of phase diagrams

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- Lecture 69 - Phases present in the system
- Lecture 70 - Composition of phases present in the system
- Lecture 71 - Proportion of phases present in the system
- Lecture 72 - Microstructure evolution during solidification in isomorphous systems
- Lecture 73 - Eutectic system
- Lecture 74 - Eutectic reaction
- Lecture 75 - Eutectic, hypoeutectic and hypereutectic alloys
- Lecture 76 - Gibbs's phase rule
- Lecture 77 - Fe-C phase diagram
- Lecture 78 - Eutectoid, hypoeutectoid and hypereutectoid steels
- Lecture 79 - Microstructure of a hypoeutectoid steel
- Lecture 80 - Microstructure of a hypereutectoid steel
- Lecture 81 - Diffusion
- Lecture 82 - Fick's first law
- Lecture 83 - Fick's second law
- Lecture 84 - Error function solution of Fick's second law
- Lecture 85 - Atomic mechanisms of diffusion
- Lecture 86 - Substitutional diffusion revisited
- Lecture 87 - Diffusion paths
- Lecture 88 - Steady and unsteady state diffusion
- Lecture 89 - Phase Transformation
- Lecture 90 - Nucleation
- Lecture 91 - Nucleation and capillary rise
- Lecture 92 - Nucleation, growth and overall transformation
- Lecture 93 - Time-temperature-transformation (TTT) diagram
- Lecture 94 - Homogeneous and heterogeneous nucleation
- Lecture 95 - Heat treatment of steels
- Lecture 96 - TTT diagram of Eutectoid Steels
- Lecture 97 - Quenching and martensite
- Lecture 98 - Austempering and bainite
- Lecture 99 - Tempering
- Lecture 100 - Residual stresses and Quench cracks
- Lecture 101 - Marquenching and martempering
- Lecture 102 - TTT diagram of hypoeutectoid and hypereutectoid steels
- Lecture 103 - TTT diagram of alloy steel
- Lecture 104 - hardenability of steels
- Lecture 105 - Glass Ceramics
- Lecture 106 - Tensile test
- Lecture 107 - Plastic deformation and crystal structure

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- Lecture 108 - Shape change
- Lecture 109 - Slip
- Lecture 110 - Resolved shear stress
- Lecture 111 - CRSS
- Lecture 112 - Schmid's law
- Lecture 113 - CRSS
- Lecture 114 - Why is experimental CRSS less than theoretical CRSS
- Lecture 115 - Strengthening mechanisms
- Lecture 116 - Dislocation density
- Lecture 117 - Frank-Read source
- Lecture 118 - strain hardening
- Lecture 119 - Dislocation interaction leading to strain hardening - I
- Lecture 120 - Dislocation interaction leading to strain hardening - II
- Lecture 121 - Solid solution hardening
- Lecture 122 - Grain size hardening
- Lecture 123 - Age hardening - I
- Lecture 124 - Age hardening - II
- Lecture 125 - Metastable precipitates
- Lecture 126 - Annealing of cold-worked metals
- Lecture 127 - Recovery
- Lecture 128 - Recrystallization
- Lecture 129 - Grain Growth
- Lecture 130 - True stress and true strain
- Lecture 131 - Creep
- Lecture 132 - Effect of stress and temperature on creep
- Lecture 133 - Creep Mechanisms
- Lecture 134 - Composites
- Lecture 135 - Isostrain modulus
- Lecture 136 - Isostress modulus
- Lecture 137 - Fracture
- Lecture 138 - Ductile and Brittle Fracture
- Lecture 139 - Role of crack size
- Lecture 140 - Griffith's Criterion
- Lecture 141 - Stress Concentration
- Lecture 142 - Ductile to brittle transition
- Lecture 143 - Enhancing fracture resistance
- Lecture 144 - Toughening of glass
- Lecture 145 - Toughening of glass
- Lecture 146 - Fatigue

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Lecture 147 - Sub-Critical crack growth